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AUTHOR Maffett, I. Lamar
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ABSTRACT

Ever since Einstein and his colleagues opened the door to quantum physics, the world has not been the same. Straight lines have become curved, the atom is no longer physical matter, and some say, science and literature have exchanged places. Literature has certainly acquired the exactness of a science, and the new sciences, particularly physics, now makes good reading. The conflict between the new order of quantum scientists and the Newtonian classicists is described. The reasons why physics is now called the Queen of the Sciences are discussed. (KR)

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It's All in the Mind:

Romantic Fact and Fiction in the New Physics

by

I. Lamar Maffett

Ever since Einstein and his colleagues opened the door to quantum physics, the world has not been the same. Straight lines have become curved, the atom is no longer physical matter, and, some say, science and literature have exchanged places. Literature has certainly acquired the exactness of a science, and the new sciences, particularly physics, now make good reading.

What goes around may come around, but the arts and sciences somehow got all tangled up on the return trip. The new sciences, composed of bibliophiles, have picked up where the ancient arts left off after the mechanists kidnapped the academy and, subsequently, the rest of society. The once organic institution became a line organization, and walls were erected between and within disciplines. Then the walls went up between nations, and finally throughout society. Divisiveness became the legacy of Laputa and nihilism its philosophy.

Then early in this century, Einstein cracked open the quantum door, just a bit to peep inside, and civil war broke out in the palace of the Queen of the Sciences. The quantum troops of Romanticism (mostly the officers) engaged in full conflict with the Newtonian Classicists (mostly the foot soldiers in the academic and industrial trenches). The conflict has continued to this day.

Back when Romanticism was located in the arts, writers showed

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more than a light interest in the sciences of their day. In retrospect, we give a passing grade in science to Shelley, while we might ask Wordsworth and later Tennyson to crack their textbooks a bit more. Goethe felt confident enough to publish a theory of optics in opposition to that of Newton, and at least two modern scientists think both were right (Leshan and Margenau 196-204). In a reversal of roles, well-known physicists today are at the head of their class in literature as they demonstrate a working knowledge of the principles of art, the Great Books, and the ability to turn a neat phrase or two of their own. They often borrow their terminology from literature; the term "quark," for example, was taken from Joyce's Finnegans Wake.

Physics has been called the Queen of the Sciences since the seventeenth century, and for good reasons, even though she snatched her tiara uncivily from the nodding head of the old dowager queen, Philosophy. This act incurred the bitter rancor of the older humanists, who considered scientific reductionism less than civilized. Swift would have them tapped on the head from time to time by a "flapper," made from an inflated bladder and filled with peas or small gravel. Yet scholars and nonscholars are still in awe of the reigning scientific monarch, even though it should be pointed out that she, like the old humanist one, puts on her gloves one at a time. For example, few professors of Introductory Physics I make clear to their students the indirectnes of their science. Physicists, who pride themselves on the extreme precision of their language, tell their students that Galileo proved Aristotle wrong by dropping two objects of different weight--say, a cannon ball and

a feather--from the Leaning Tower of Pisa and that both objects take the same time to hit the ground. Clearly this is not the real world they are describing, and if you press the physicists on this experiment, they will admit that the two bodies fall equally fast only in a vacuum. Press them further, and they will reluctantly admit that no one has ever made a vacuum, nor are they ever likely to do so. Vacuums (empty spaces) do not exist anywhere in Nature. The experiment is entirely hypothetical, and Aristotle may be considered correct from a practical point-of-view.

Physics deals in abstractions, which may be why it is so scientific and popular with some. Abstractions are clinically safe. Physics deals in exact measurements and theoretical mathematics, carefully defined and precisely-used terms, and rigid progressions of logic. Physics is a dignified science--or at least it was until Einstein became overcurious about what was behind the quantum door. He did not intend to enter it--only open it a bit to "observe" what was inside. But like Milton's smokey Gates of Hell, once opened, all of the subatomic Furies rushed past the startled Newtonian physicist, sullying his antiseptic smock. (And Hell hath no Fury like a rejected Reductionist.)

First, it was Werner Heisenberg with his Keystone Cops of Uncertainty (all quite mathematical, but not Euclidean, as it was before Einstein). Niels Bohr added a dash of wave-particle Complementarity to the cauldron from the Chinese Yin and Yang, which, like Uncertainty, attached itself permanently to the physics

textbooks. And then, as if that were not enough, Sir Arthur Eddington dropped a few slithy toves into the bubbling oxygen wabe. He said that all of the fundamentals of physics could be summed up as "Jabberwocky." From a few initial leaks in the Newtonian dike,a flood of Romantic judgments poured forth from the best-known names in physics, ideas which soon spread to other sciences, such as neurology and psychology.

The internecine melee in science has become downright dangerous. On the one side are the Newtonian-Comtian-Cartesian-Copernican Reductionists, and on the other the postEinsteinian quantum kids, led by a formidable coalition of Heisenberg, Schrödinger, Bohm, Bohr, Wheeler, Bell and a galaxy of stellar names in the cosmos of the new physics. It is little wonder that nuclear physicist Enrico Fermi declared that, if he had seen this coming, he would have majored in zoology. Ervin Schrödinger said of his mathematically sound theory of alternate realities: "I don't like it, and I'm sorry I ever had anything to do with it."

Time and public sentiment are on the quantum side. Whether by the end of this century or the next, the new kids on the block ("relatively" speaking--the quantum theory has been around since 1926 and the special theory of relativity since 1905) will own the scientific turf. Reductionists "in time" will be reduced to quaint technologists. Few will mourn the crashlanding of Laputa, while many, especially the Wall Street Philistines, are cheering the liftoff of relativity and quantum mechanics. Already the quantum sciences have produced modern electronics, computers, television,

nuclear energy, lasers and space communications; and the new sciences should really get off the ground when they make antigravity practical and nonpolluting cold fusion affordable.

The quantum sciences have become to language and literature what the briar patch was to Br'er Rabbit. The new physicists express their ideas metaphorically, not only because they are humanists at heart, but also because they have few other options for describing the quantum world. Despite the continuing media hype, the cosmos is no longer Carl Sagan's Copernican playground. It is viewed both subjectively and scientifically variously as a code (Pagels), an unfolding flower (Young), or a holographic movie that is at once unified, thematic, and a mirror to a higher nature. It may thus also be considered an epic in which we all play the key character role--sometimes villain, sometimes protagonist, but entirely necessary to its continuance and outcome.

The new physics not only elicits, it requires, a subjective attitude. The "objective observer" ceased to exist with the publication of Heisenberg's Principle of Uncertainty. The new science has taken us below Newton's mechanical domain (called the "naive reality" by some physicists today) to an unseen world where Truth and Beauty reside as Keatsian principles that ensoul the energy matrices beginning with leptons, muons, and neutrinos. Within the writer's mind (not brain only, which now is seen as separate from, but indispensable to, the mind) continues unbroken this same mysterious creative domain where intuition organizes

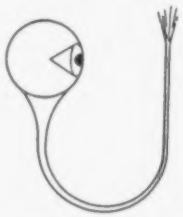
reality, not always as Truth and Beauty, but usually from the dark, boiling cauldron of subconscious archetypes.

Einstein's colleague, Heisenberg, first expressed this new world as an equation: $\Delta r \cdot \Delta v \geq \frac{h}{2m}$. It is called the Uncertainty Principle because in the subatomic world (the building blocks of the so-called matter universe) we can never know at the same time both the location and speed of a particle, such as an electron. Nor do we know <u>what</u> it is. It is nothing ("no-thing"). This formula became a ticking nuclear bomb that exploded the myth of time and space forever as fundamentals of physics. Fred Allen Wolf said of this principle: ". . . once it is fully understood, it could create a condition of enlightenment in which the world is seen as an illusion and as a product of mind or consciousness" (<u>Parallel Universes</u> 330). Wolf, like all of his colleagues in physics, adds the element of "a risk-taking psyche--that is, one that chooses":

> We cannot help or stop this risk. . .that results from these choices. These arise as inevitable consequences because the Heisenberg principle of uncertainty and the Bohr principle of complementarity operate in our daily lives. . . . We are the creators of <u>this</u> universe. We shape its raw materials into our fantasies, which we call realities.
>
> Paraphrasing the words of visionary physicist John A. Wheeler, there is absolutely--and I mean totally and undeniably--no elementarily known phenomenon of nature unitl it is an observed phenomenon. (<u>Star Wave</u> 216-17)

Wheeler is codeveloper of the Many Worlds Theory, served as head of the Center for Theoretical Physics, University of Texas at Austin, and is now professor emeritus at Princeton Univrsity. He concluded that calling scientists and nonscientists "observers" of the universe does not adequately describe the transformational impact of their minds on the mathematical potential we once called matter. They change the cosmos merely by their thoughts. Wheeler substituted the word "participants" for "observer": We are participants in the creation of the world, and many think this responsibility carries with it the need at least to be good artists. If we create our own reality, why not make it a pretty one?

Physicist/geophysicist Louise B. Young must have read Dante. She believes that the cosmos and its systemic, symbiotic, holonomic parts (including people) are evolving into "higher and higher degrees of organization." The final image will be like that of a flower in full bloom. Further, the universe, in its rites of passage, is becoming increasingly conscious of itself and its melioristic destiny. Physicists often Wheeler's picture to show this
evolving self-consciousness:



The commonly held view of the cosmos in physics today is very Wordsworthian. The universe is especially adapted for the benefit and evolution of humankind (Peat 241, Talbot 38, Barrow and Tipler 11). This view of the cosmos is called the Anthropic Cosmological Principle, and according to Pagels, it has demolished forever the simplistic Copernican heliocentric world view, "a revolution that began with the invention of the theory of relativity and quantum mechanics . . . and which has left most educated people behind" (310).

Like an angry Odysseus back home again in Ithaca, the new/old world view spares none of the freeloaders. Logic, content, and expression are all targets for the avenging quantum arrows. Commonsense, linear, cause-and-effect logic (which served well its Iron Age masters for two hundred years) has become circular. Newton's logic still works well in the Philistinic reality, but not in the Hellenic, subatomic domain; and it was abandoned in favor of Riemannian (curved-space) geometry. Hints, indirection and metaphor are now the order of expression and understanding. Circular, Semitic, Romance and Russian modes of reasoning are better adapted to describe this land where time/space disappear in the wormholes of space and quarks wink in and out of existence, subject to human thought. Perhaps this accounts in part for the recent reintroduction of freewriting into the composition class.

Nothing is insignificant or without meaning in the cosmos now. The study of chaos has shown that any chaotic phenomena, from star dust to cigarette smoke, have meaning and impact upon the rest of the cosmos. Physicists and mathematicians began their

investigation of

chaos with the Butterfly Effect, so called from "chaotic" phenomena like weather which have a "sensitive dependence on initial conditions," "the notion that a butterfly stirring the air today in Peking can transform storm systems next month in New York" (Gleick 8).

When physicists focused on subatomic energies, after awhile they discovered the long-abandoned ontological questions: Who am I? Where am I going? and How do I get there? The first question became irrelevant, following the seventeenth century tabla rasa concept, when we decided that students were unprogrammed robots. They were to be programmed from the outside. But, like Professor Higgins, we forgot that education is qualitative and personal, not quantitative and mechanistic; that educare (L.) means "to draw out," not "to put in." The tabla rasa concept precipitated our current crisis in education; as a subset of reductionism, which is a self-collapsing logic, tabla rasa left no motivation to learn for the student. Professor Higgins and Eliza both made their quantum leaps back to the future, and both discovered something important about learning: a holistic education includes the head and the heart.

In answer to the second question, Where am I going?, the new sciences offer an ambiguous "upwards." Mankind and the cosmos are ascending a Yeatsian evolutionary spiral, imaged in the DNA helix (Young 151; Wolf Parallel Universes 330, Star Wave 183; O'Leary

118). Our ascension, however, may be symbiotic. Cambridge biologist Rupert Sheldrake proposed a mysterious, and somewhat controversial, morphogenetic field that, he and other empirical researchers say, connects all living creatures and people within their distinctive species. Possessing a "group mind," the species advances (or presumably retreats) morphogenetically as each member makes evolutionary choices. Perhaps "No man or woman is an island."

The new scientists appear to be unanimous in their answer to the queestion, How do I get there? Because the Heisenberg Principle of Uncertainty and the Bohr Principle of Complementarity operate each time we think, our choices constantly create and recreate our reality and edit our body cells, RNA, and DNA. The concept of cosmic unity requires a seamless fabric of energy from the reality "out there" to the one in the mind. This is where commonsense credibility is stretched even in the exact science of physics. Physicist Wolf states, "We are the creators of this universe" (Star Wave 216). Wolf continues: "This freedom of choice of ours applies all the way down to our atomic constituents. We choose and the world appears, like Aladdin's genie. . ." (18).

We should not wonder that English literature survey courses early in this century began to drop the metaphysical poets; yet if the young poets at that time imitated Donne's sounds, they might, in the light of modern discoveries in physics, be encouraged to look at Donne's ideas--and those of Browning and Hopkins, their other role models. The metaphysical poets--and most of the other poets before, and many after, the Rationalists--had something

important to say.

Joseph Campbell seemed always to ask the right questions, and more frequently than not offered good answers. In his last work, The Inner Reaches of Outer Space, he stated:

> The old gods are dead or dying and people everywhere are searching, asking: What is the new mythology to be, the mythology of this unified earth as of one harmonious being?. . . the new mythology . . . is already implicit among us as knowledge a priori, native to the mind . . . . In a paper by Ananda K. Coomaraswamy. . . the point is made with respect to the metaphorical language of mythology and metaphysics that its "worlds" and "gods" are levels of reference and symbolic entities which are neither places nor individuals but states of being realizable within you. . . . In other words, . . . outer space is within us inasmuch as the laws of space are within us; outer and inner space are the same. (17 et passim)

Although Campbell had sailed beyond the portals of physics to Byzantium, he might have added:

> The gods are human. Mankind are their own prophet, priest, supplicant and deity. In the new Saturnian cosmos, energy (matter) is unified, intelligent, and nonlocal (nonphysical), and the new sciences and the

> ancient arts chorus-like chant the new ritual: "We have purified the old order in the aquarian waters of Chaosology, resurrected the Fisher King in the phoenix fires of high-speed energies, and endowed him with immortality from the Second Law of Thermodynamics. Lo, the center of the universe is within you."

Then again, he might not. In the quantum world of parallel universes, as in fiction, you can have it all ways.

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